CLAIMS

What is claimed is:

1. A method of filtering an input data signal and a compressed data signal in a digital signal processing system, comprising the steps of:

generating wavelet coefficients for an analysis filter bank and a synthesis filter bank;

representing the wavelet coefficients for the analysis filter bank as canonical signed digits thereby forming a coded analysis filter bank;

representing the wavelet coefficients for the synthesis filter bank as canonical signed digits thereby forming a coded synthesis filter bank;

filtering the input data signal using the coded analysis filter bank; and

filtering the compressed data signal using the coded synthesis filter bank.

2. The method of claim 1, wherein the wavelet coefficients for the analysis filter bank and the synthesis filter bank are, prior CSD-conversion, integer wavelet coefficients.

3. The method of claim 1, wherein the wavelet coefficients for the analysis filter bank and the synthesis filter bank are, prior CSD-conversion, rounded-off wavelet coefficients.

4. The method of claim 1, wherein the wavelet coefficients for the analysis filter bank and the synthesis filter bank are, prior CSD-conversion, truncated wavelet coefficients.

5. The method of claim 1, wherein the wavelet coefficients for the analysis and synthesis filter banks are, prior CSD-conversion, floating point wavelet coefficients.

6. A method for decomposing data signals in a digital data system having an encoder portion and a decoder portion, comprising the steps of:

receiving an input data signal through the encoder portion of the digital data system;

generating a compressed data signal in the encoding portion of the digital data system;

generating a decompressed data signal in the decoding portion of the digital data system derived from the compressed signal;

generating wavelet coefficients for an analysis filter bank and a synthesis filter bank;

selecting a value, N, to represent the number of powers-of-two terms to represent the wavelet coefficients;

CSD-coding the wavelet coefficients based on the selected value of N;

adjusting the value of N depending on a predetermined threshold to obtain optimized CSD-coded wavelet coefficients for the analysis filter bank and the synthesis filter bank;

filtering the input data signal using the optimized CSD-coded wavelet coefficients of the analysis filter bank; and

filtering the decompressed data signal using the optimized CSD-coded wavelet coefficients of the synthesis filter bank.

7. The method of claim 6, wherein the predetermined threshold is based on a predetermined reconstruction error.

8. The method of claim 6, wherein the predetermined threshold is based on a predetermined test image.

9. The method of claim 6, wherein the step of selecting the value of N further comprises the step of determining whether the same value of N is selected for the analysis filter bank as for the synthesis filter bank.

10. The method of claim 9, wherein the step of selecting the value of N further comprises the step of selecting the value for N according to the significance of the wavelet coefficient.

11. The method of claim 9, wherein the predetermined threshold is based on a predetermined reconstruction error.

12. The method of claim 9, wherein the predetermined threshold is based on a predetermined test image.

13. The method of claim 6, wherein the step of generating wavelet coefficients comprises the step of generating integer wavelet coefficients.

14. The method of claim 6, wherein the step of generating wavelet coefficients comprises the step of generating floating point wavelet coefficients.

15. The method of claim 6, wherein the step of generating wavelet coefficients comprises the step of generating truncated wavelet coefficients.

16. The method of claim 6, wherein the step of generating wavelet coefficients comprises the step of generating rounded-off wavelet coefficients.

17. A method of forward and inverse decomposing an input data signal and a compressed data signal in a lossy encoder-decoder subband coding system, comprising the steps of:

generating wavelet coefficients for the analysis filter bank as part of the encoder;

generating wavelet coefficients for the synthesis filter bank as part of the decoder;

representing the wavelet coefficients for the analysis filter bank as canonical signed digits (CSD) thereby forming a CSD-coded optimal representation of the analysis filter;

representing the wavelet coefficients for the synthesis filter bank as canonical signed digits (CSD) thereby forming a CSD-coded optimal representation of the synthesis filter;

performing a forward signal decomposition for the input data signal using the CSD-coded analysis filter; and

performing an inverse signal transformation on the compressed data signal using the CSD-coded synthesis filter.

18. The method according to claim 17, further comprising the step of:

selecting a value, Ma, to represent the resulting number of CSD-coded coefficients from the optimal representation of the analysis filter;

adaptively adjusting the value of Ma to reduce the number of CSD-coded coefficients from the optimal representation of the analysis filter.

19. The method according to claim 18, whereby the process of adaptively adjusting the value of Ma is based on a measure of accepted recovered image quality.

20. The method according to claim 18, further comprising the step of:

selecting a value, Ms, to represent the resulting number of CSD-coded coefficients from the optimal representation of the synthesis filter;

adaptively adjusting the value of Ms to reduce the number of CSD-coded coefficients from the optimal representation of the synthesis filter.

21. The method according to claim 20, whereby the process of adaptively adjusting the value of Ms is based on a measure of accepted recovered image quality.

22. The method according to claim 18, where the step of selecting the value of Ma further comprises the step of adjusting its value according to the significance of the wavelet coefficient.

23. The method according to claim 18, wherein the step of selecting the value of Ma, further comprises the step of adjusting its value according to the significance of the subband.

24. The method according to claim 18, where in the step of selecting the value of Ma, further comprises the step of setting Ma to zero when processing the lowest frequency subband in a subband coding system.

25. The method according to claim 18, further comprising the step of selecting a value, Na, to represent the number of terms for each of the Ma selected number of CSD-coded coefficients of the analysis filter.

26. The method according to claim 20, wherein the step of selecting the value of Ms, further comprises the step of adjusting its value according to the significance of the wavelet coefficient.

27. The method according to claim 20, wherein the step of selecting the value of Ms, further comprises the step of adjusting its value according to the significance of the subband.

28. The method according to claim 27, wherein the step of selecting the value of Ns further comprises the step of selecting its value according to the significance of the subband.

29. The method according to claim 20, wherein the step of adjusting the value of Ms, further comprises the step of setting Ms to zero when processing the lowest frequency subband.

30. The method according to claim 20, further comprising the step of selecting a value, Ns, to represent the number of terms for each of the Ms selected number of CSD-coded coefficients of the synthesis filter.

31. The method according to claim 23, wherein the step of selecting the value of Na, further comprises the step of adjusting its value according to the significance of the subband.